ORDER NO.HAD8803059C0

Service Manual

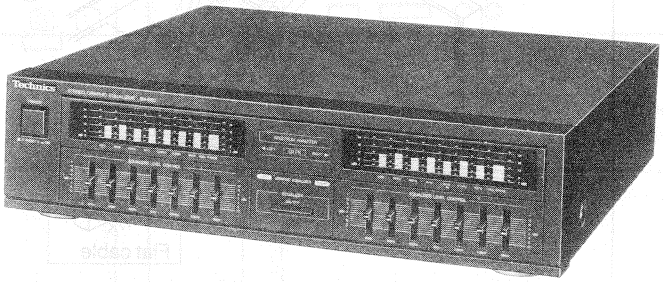
Stereo Graphic Equalizer

Equalizer

SH-E60

Color

(K) .....Black Type



Area

Color	Area
(K)	(EX) .....Continental Europe.
(K)	(EW) .....Switzerland.
(K)	(Ei) .....Italy.
(K)	(EG).....F.R.Germany.
(K)	(EB).....Belgium.
(K)	(EK).....United Kingdom.
(K)	(EF) .....France.
(K)	(EH).....Holland.
(K)	(XL) .....Australia.
(K)	(XA).....Asia,Latin America,Middle Near East,Africa and Oceania.
(K)	(XB).....Saudi Arabia.

SPECIFICATIONS

(DIN 45 500)

Frequency response (center position)	5 Hz ~ 100 kHz, -3 dB
Maximum output voltage	7 V (1 kHz, THD 0.03%)
Rated output voltage	1 V
Rated total harmonic distortion	0.007% (20 Hz~ 20 kHz),at 1V output 0.005% (1 kHz),at 1V output
Input sensitivity	1 V
Signal-to-noise ratio	98dB/1V (105dB/1V,IHF'A)
Maximum input voltage	7 V (1 kHz)
Input impedance	47 kΩ
Gain	0±1 dB
Channel balance 250Hz ~ 6300Hz	± 0.5dB
Channel separation 1kHz	70dB
Equalization-level controls	+ 12 dB ~ -12dB (7 elements continuously variable per channel)
Center frequency	63 Hz, 160 Hz, 400 Hz, 1 kHz 2.5 kHz, 6.3 kHz, 16 kHz

GENERAL

Power supply	
For Continental Europe	AC 220 V, 50 Hz/60 Hz
For United Kingdom and Austraria	AC 240 V, 50 Hz/60 Hz
For others	AC 110 V ~ 127 V/220 V ~ 240 V, 50 Hz/60 Hz
Power consumption	11 W (With power switch to STANDBY : 5W)
Dimensions (W x H x D)	360 X 91 X 287 mm (14-3/16" X 3-19/32" X 11-5/16")
Weight	2.8 kg (6.2 lb.)

Specifications are subject to change without notice for further improvement. Weight and dimensions are approximate.

CONTENTS

	Page
LOCATION OF CONTROLS	2
ACCESSORIES	2
CONNECTIONS	3
CHARCTERISTICS OF EACH FREQUENCY RANGE	3
DISASSEMBLY INSTRUCTIONS	4
FUNCTION OF IC TERMINALS	5
CIRCUIT BOARDS AND WIRING CONNECTION DIAGRAM	6 ~ 8
TERMINAL GUIDE OF TRANSISTORS,DIODES AND IC'S	8
SCHEMATIC DIAGRAM	9 ~ 12
DESCRIPTION OF FL PANEL	13
BLOCK DIAGRAM	14,15
EXPLODEA VIEW	16,17
REPLACEMENT PARTS LIST	18,19
RESISTORS AND CAPACITORS	20,21

Technics

Matsushita Electric Industrial Co., Ltd.
Central P.O. Box 288, Osaka 530-91, Japan

ORDER NO.HAD8803059C0

Service Manual

Equalizer

Stereo Graphic Equalizer

SH-E60

Color

(K) .....Black Type

Area

Color	Area
(K)	(EX) .....Continental Europe.
(K)	(EW) .....Switzerland.
(K)	(Ei) .....Italy.
(K)	(EG).....F.R.Germany.
(K)	(EB).....Belgium.
(K)	(EK).....United Kingdom.
(K)	(EF) .....France.
(K)	(EH).....Holland.
(K)	(XL) .....Australia.
(K)	(XA).....Asia,Latin America,Middle Near East,Africa and Oceania.
(K)	(XB).....Saudi Arabia.

SPECIFICATIONS

(DIN 45 500)

Frequency response (center position)	5 Hz ~ 100 kHz, -3 dB
Maximum output voltage	7 V (1 kHz, THD 0.03%)
Rated output voltage	1 V
Rated total harmonic distortion	0.007% (20 Hz~ 20 kHz),at 1V output 0.005% (1 kHz),at 1V output
Input sensitivity	1 V
Signal-to-noise ratio	98dB/1V (105dB/1V,IHF'A)
Maximum input voltage	7 V (1 kHz)
Input impedance	47 kΩ
Gain	0±1 dB
Channel balance 250Hz ~ 6300Hz	± 0.5dB
Channel separation 1kHz	70dB
Equalization-level controls	+ 12 dB ~ -12dB (7 elements continuously variable per channel)
Center frequency	63 Hz, 160 Hz, 400 Hz, 1 kHz 2.5 kHz, 6.3 kHz, 16 kHz

CONTENTS

	Page
LOCATION OF CONTROLS	2
ACCESSORIES	2
CONNECTIONS	3
CHARCTERISTICS OF EACH FREQUENCY RANGE	3
DISASSEMBLY INSTRUCTIONS	4
FUNCTION OF IC TERMINALS	5
CIRCUIT BOARDS AND WIRING CONNECTION DIAGRAM	6 ~ 8
TERMINAL GUIDE OF TRANSISTORS,DIODES AND IC'S	8
SCHEMATIC DIAGRAM	9 ~ 12
DESCRIPTION OF FL PANEL	13
BLOCK DIAGRAM	14,15
EXPLODEA VIEW	16,17
REPLACEMENT PARTS LIST	18,19
RESISTORS AND CAPACITORS	20,21

GENERAL

Power supply	
For Continental Europe	AC 220 V, 50 Hz/60 Hz
For United Kingdom and Austraria	AC 240 V, 50 Hz/60 Hz
For others	AC 110 V ~ 127 V/220 V ~ 240 V, 50 Hz/60 Hz
Power consumption	11 W (With power switch to STANDBY : 5W)
Dimensions (W X H X D)	360 X 91 X 287 mm (14-3/16" X 3-19/32" X 11-5/16")
Weight	2.8 kg (6.2 lb.)

Specifications are subject to change without notice for further improvement. Weight and dimensions are approximate.

Technics

Matsushita Electric Industrial Co., Ltd.
Central P.O. Box 288, Osaka 530-91, Japan

SH-E60

■ LOCATION OF CONTROLS

●Power "STANDBY ⏻ • ON" switch (POWER)
This switch turns ON and to STANDBY the secondary circuit power only. The unit is in the "STANDBY" condition when this switch is set to the "⏻" position. Regardless of the switch setting, the primary circuit is always "live" as long as the power cord is connected to an electrical outlet:

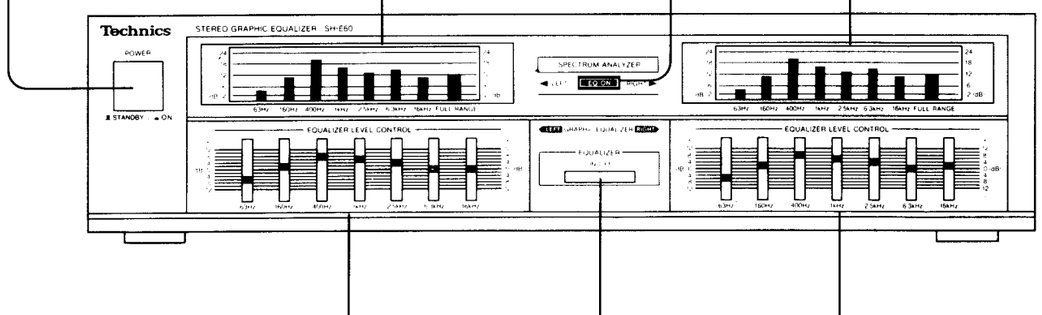
Note:
- For this unit, even if this switch is switched to the "STANDBY" position, there is still a power consumption of about 5 watts; this is to assure the retention of the equalizer circuit function.

"Power-through" function
Discs, radio broadcasts, etc. can be heard even if the power of this unit is switched to STANDBY.
Note, however, that the power plug should be left connected to the AC outlet.

●Equalization-mode indicator (EQ ON)
When the equalization mode select button is pressed, the "EQ ON" indicator will illuminate.

●Right-channel spectrum display
The display shows the right channel spectrum level.
The display of the spectrum or full range level is shown in the same way as the left-channel.

●Left-channel spectrum display
The display shows the left channel spectrum level.
The "FULL RANGE" area on the right side displays the combined level of all of the frequency bands.



●Left-channel band-level controls (EQUALIZER LEVEL CONTROL)
These levers are used to adjust the 7 frequency levels that result from dividing the 63 Hz~16 kHz frequency range into 7. When these levers are moved in the "+ dB" direction, peak frequency characteristics are obtained. When they are moved in the "– dB" direction, dip frequency characteristics are obtained. These characteristics can be emphasized or attenuated a maximum of 12 dB.

●Right-channel band-level controls (EQUALIZER LEVEL CONTROL)
These levers function in the same way as the left-channel band-level controls.

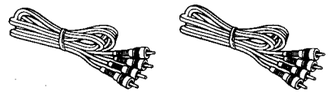
●Equalization mode select button (EQUALIZER)
This button can be used to select the type of equalization correction.
When this button is pressed, the mode changes alternately to one or the other of the following modes.

ON: Select this mode to make an equalization correction.
(The "EQ ON" indicator will illuminate.)

OFF: Select this mode if no equalization correction.
By turning this button ON and OFF, the equalizer effect can also be checked.

■ ACCESSORIES

- Stereo connection cables 2



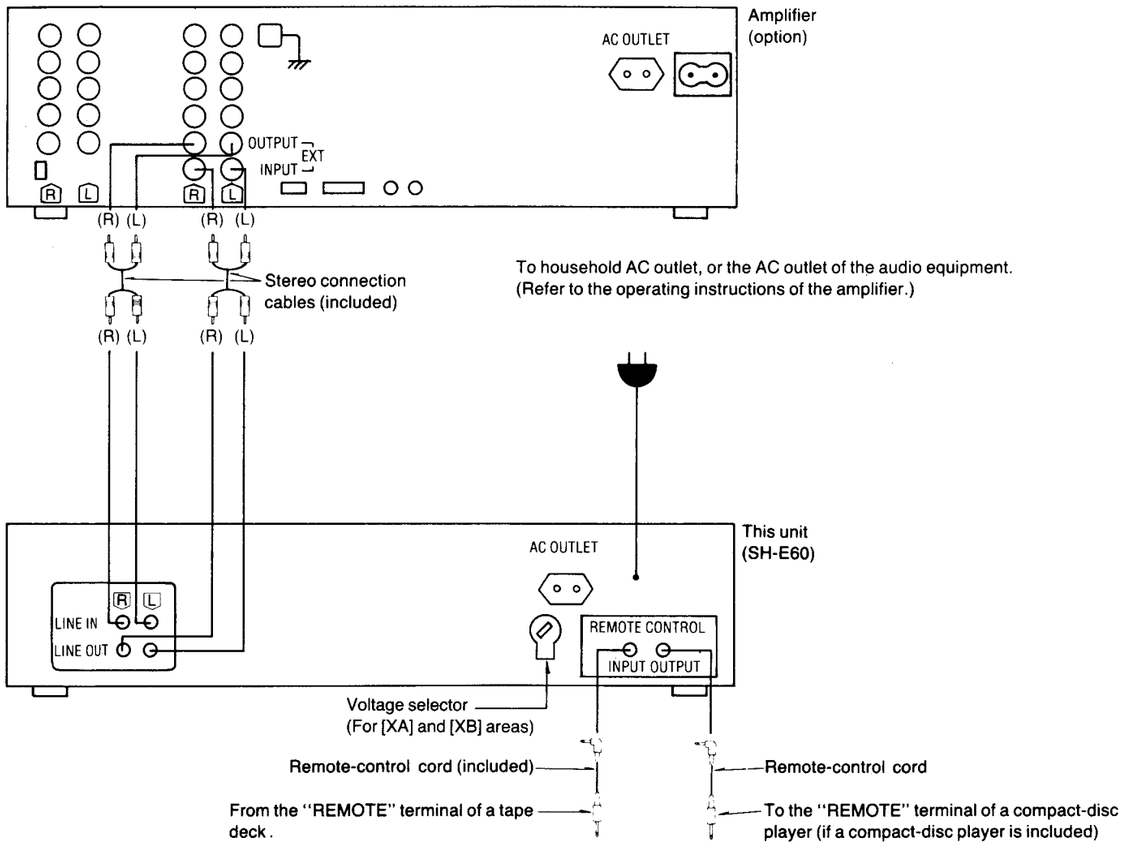
(SJPK2202-1)

- Remote-control cord 1

(SJP2257T)

■ CONNECTIONS

This is an equalizer that provides effects both during tape recording and playback if it used while connected to an amplifier (such as models SU-X980D, SU-X950, etc.) that has "EXT IN/OUT" terminals.
If this unit is connected to an amplifier that does not have "EXT IN/OUT" terminals, its effects are limited to playback only.



■ CHARACTERISTICS OF EACH FREQUENCY RANGE

63 Hz Deep bass range
The sounds of the bass, drums, etc. are dramatically strengthened.

160 Hz Bass range
This range provides the sounds of the saxophone, trombone, etc. sounds can be clarified, if indistinct, by reducing this setting.

400 Hz Mid-bass range (the fundamental range for music)
This control can be used to reinforce the sounds of male vocals, etc.

1 kHz Mid-range
This control can be used to add clear presence and realism to female vocals, etc.

2.5 kHz Mid-high range
This range provides clarity and color variations to stringed instruments, etc.

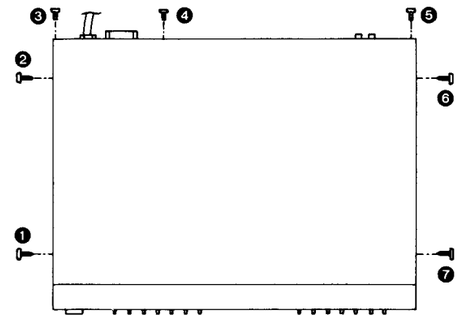
6.3 kHz Treble range
This control can be used to brighten the sounds of the flute and similar instruments. If sounds seem too jarring, a softness can be applied by reducing the setting.

16 kHz Super-treble range
This control can be used provide an extra measure of delicate vibration to the sounds of the cymbals, triangle, etc.
If tape "hiss" noises are annoying, this control's setting can be reduced to alleviate such noises.

■ DISASSEMBLY INSTRUCTIONS

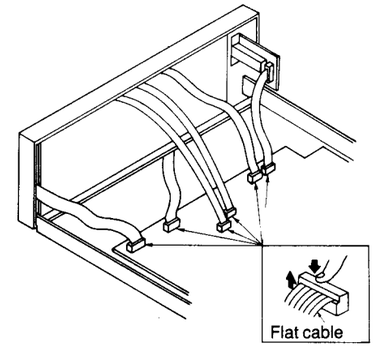
Ref. No. 1 — How to remove the cabinet

Procedure 1
●Remove the 7 screws (❶~❼).



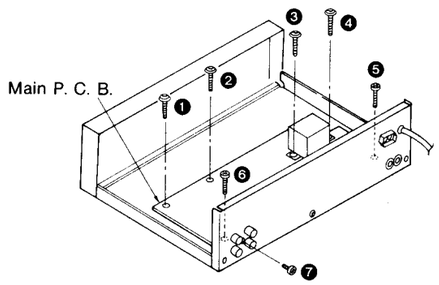
Ref. No. 2 — How to remove the connector

Procedure 1→2
●Disconnect the lead ties of the 6 connectors (J1, J2, J3, J4, J5, J6)



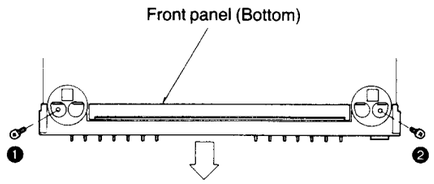
Ref. No. 3 — How to remove the main P.C.B.

Procedure 1→3
1. Remove the 6 screws (❶~❻).
2. Remove a screw (❼) from the jack P.C.B.



Ref. No. 4 — How to remove the front panel

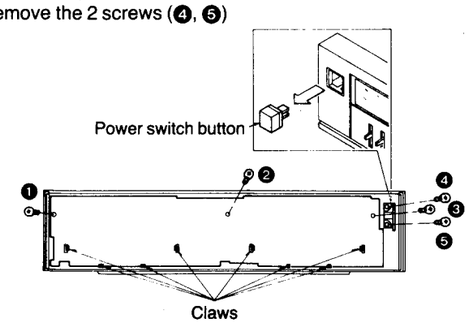
Procedure 1→2→4
●Remove the 2 screws (❶, ❷) on the bottom of the front panel in the direction of the arrows.



Ref. No. 5 — How to remove FL/VR P.C.B.

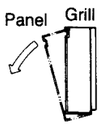
Procedure 1→4→5
1. Remove the 3 screws (❶~❸).
2. Remove the 8 claws.

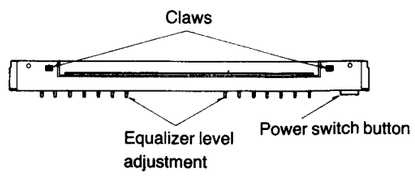
●Power switch P.C.B.
1. Pull out the power switch button.
2. Remove the 2 screws (❹, ❺)



Ref. No. 6 — How to remove the equalizer level adjustment controls

Procedure 1→4→5→6
1. Remove the 2 claws on the lower side of the front panel.
2. Take the panel and grill apart in the direction of the arrow.
3. Pull out the equalizer level adjustment controls.





Note: The power switch button is turned on.

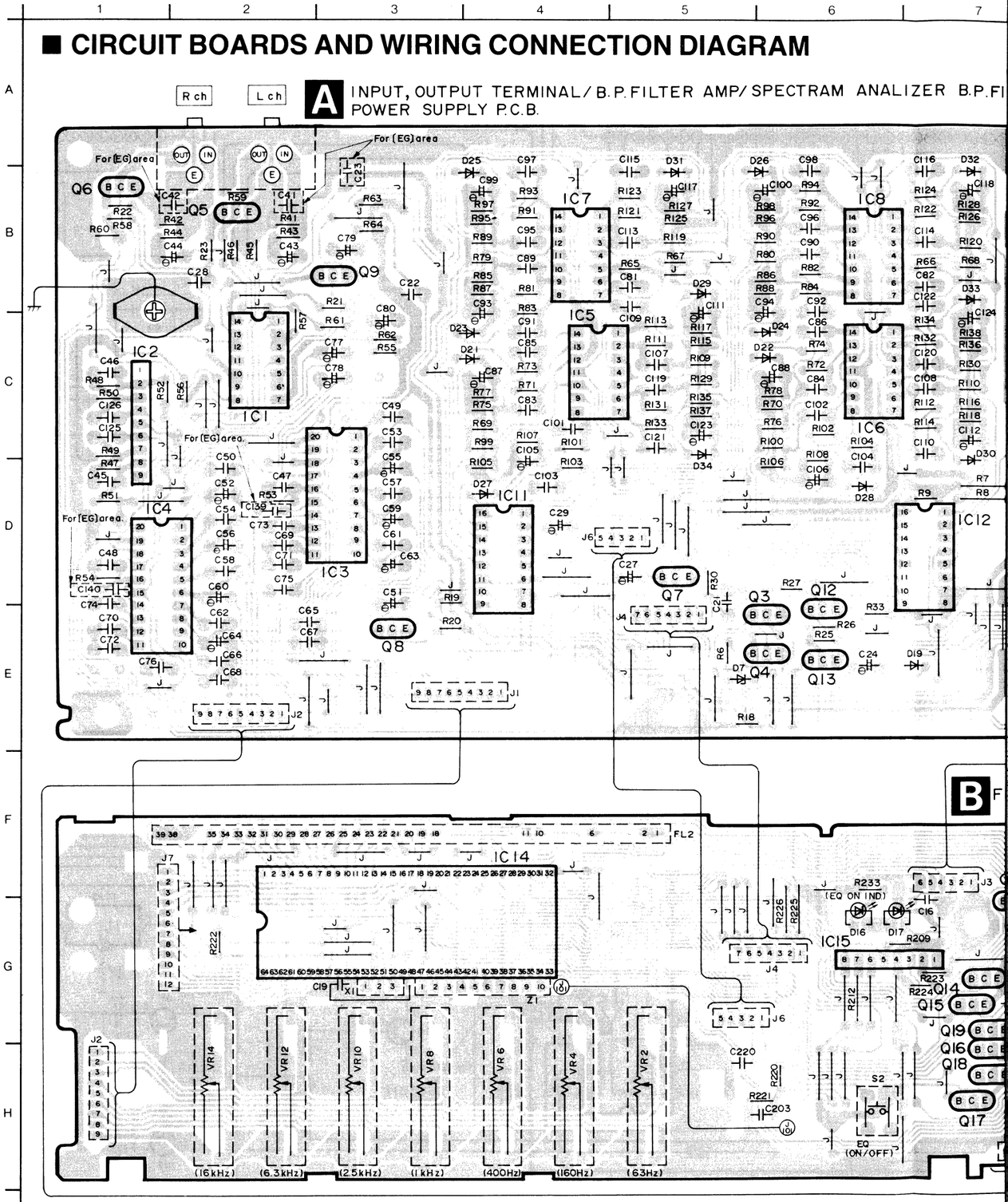
■ FUNCTION OF IC TERMINALS

•Microcomputer IC14 (HD614042 SH12)

Pin No.	Symbol	I/O	Function
1	D11	O	2 dB segment output to FL meter. (Rch)
2	D12	O	4 dB segment output to FL meter. (Rch)
3	D13	O	6 dB segment output to FL meter. (Rch)
4	D14	O	8 dB segment output to FL meter. (Rch)
5	D15	O	24 dB segment output to FL meter. (Lch)
6	R00	O	10 dB segment output to FL meter. (Rch)
7	R01	O	12 dB segment output to FL meter. (Rch)
8	R02	O	14 dB segment output to FL meter. (Rch)
9	R03	O	16 dB segment output to FL meter. (Rch)
10	R10	O	18 dB segment output to FL meter. (Rch)
11	R11	O	20 dB segment output to FL meter. (Rch)
12	R12	O	22 dB segment output to FL meter. (Rch)
13	R13	O	24 dB segment output to FL meter. (Rch)
14	R20	O	22 dB segment output to FL meter. (Lch)
15	R21	O	20 dB segment output to FL meter. (Lch)
16	R22	O	18 dB segment output to FL meter. (Lch)
17	R23	O	16 dB segment output to FL meter. (Lch)
18	RA0	I	A/D input, high withstand voltage.
19	RA1	I	Output power supply (−32 V) for high withstand voltage terminals.
20	R30	O	Muting output H: Muting off, L: Muting on.
21	R31	O	Equalizer ON/OFF control. H: OFF L: ON
22	R32	I	Power switch on/off detection. H: on, L: off.
23	R33	—	————
24	R50	O	FL meter's 16 kHz grid output.
25	R51	O	FL meter's all-band grid output.
26	R52	O	FL meter's 160 Hz grid output.
27	R53	O	FL meter's 63 Hz grid output.
28	R60	O	MPX data A output
29	R61	O	MPX data B output
30	R62	O	MPX data C output
31	R63	—	————
32	VCC	I	5 V power supply.

Pin No.	Symbol	I/O	Function
33	R40	I	Remote control data. Communication data clock input.
34	R41	I	Remote control data. Communication data input.
35	R42	O	Chip select of MPX (Lch)
36	R43	O	Chip select of MPX (Rch)
37	R70	O	A/D conversion data bit 7 output.
38	R71	O	A/D conversion data bit 6 output.
39	R72	O	A/D conversion data bit 5 output.
40	R73	O	A/D conversion data bit 4 output.
41	R80	O	A/D conversion data bit 3 output.
42	R81	O	A/D conversion data bit 2 output.
43	R82	O	A/D conversion data bit 1 output.
44	R83	O	A/D conversion data bit 0 output.
45	R90	—	————
46	R91	I	Power switch on/off detection. H: on, L: off.
47	R92	I	Equalizer key signal input.
48	R93	—	————
49	RESET	I	Reset signal input.
50	TEST	—	————
51	OSC1	I	Clock signal input.
52	OSC2	O	Clock signal output.
53	GND	I	Grounding
54	D0	O	FL meter's 2.5 kHz grid output.
55	D1	O	FL meter's 1 kHz grid output.
56	D2	O	FL meter's 400 Hz grid output.
57	D3	O	FL meter's 6.3 kHz grid output.
58	D4	O	2 dB segment output to FL meter. (Lch)
59	D5	O	4 dB segment output to FL meter. (Lch)
60	D6	O	6 dB segment output to FL meter. (Lch)
61	D7	O	8 dB segment output to FL meter. (Lch)
62	D8	O	10 dB segment output to FL meter. (Lch)
63	D9	O	12 dB segment output to FL meter. (Lch)
64	D10	O	14 dB segment output to FL meter. (Lch)

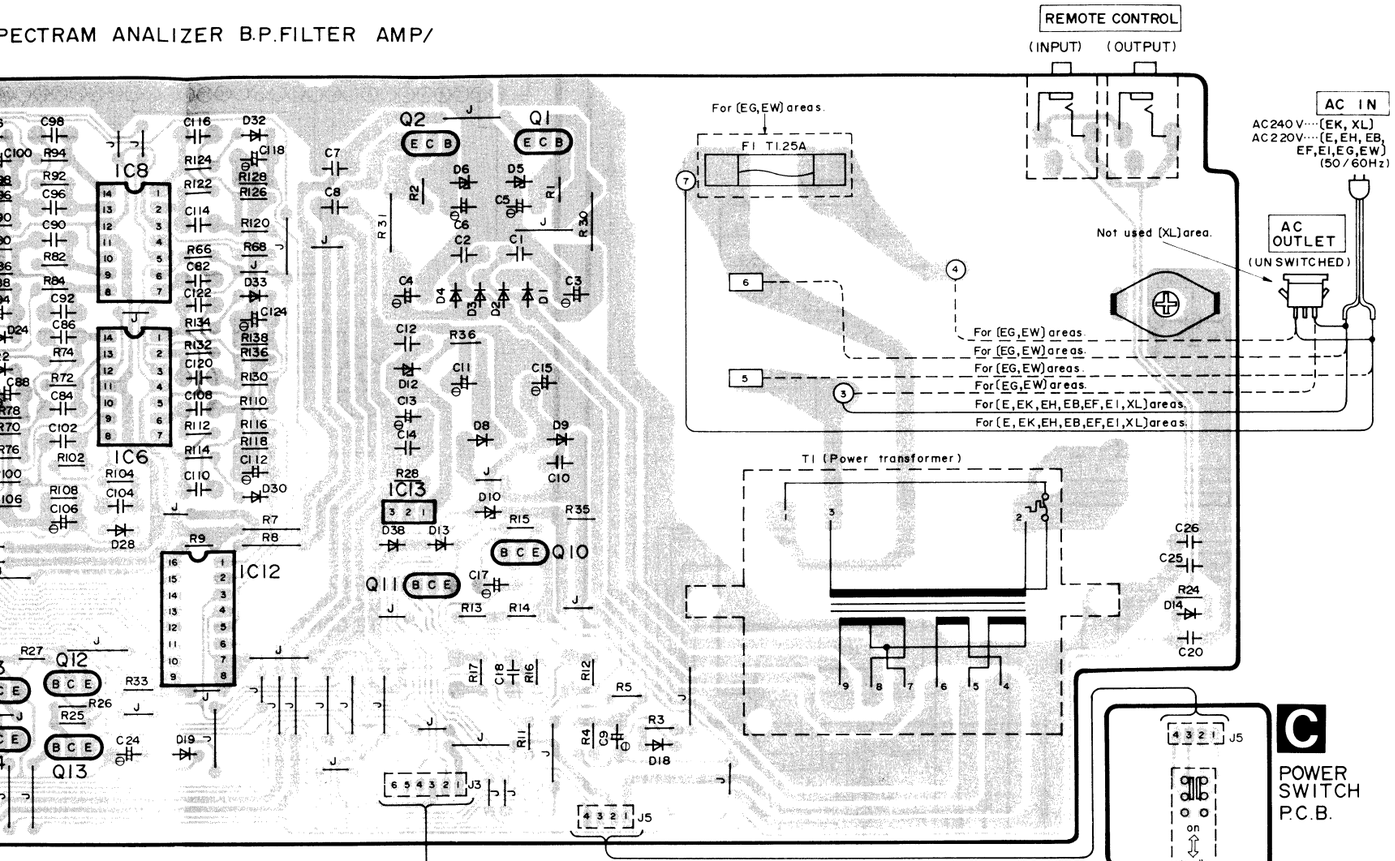
■ CIRCUIT BOARDS AND WIRING CONNECTION DIAGRAM

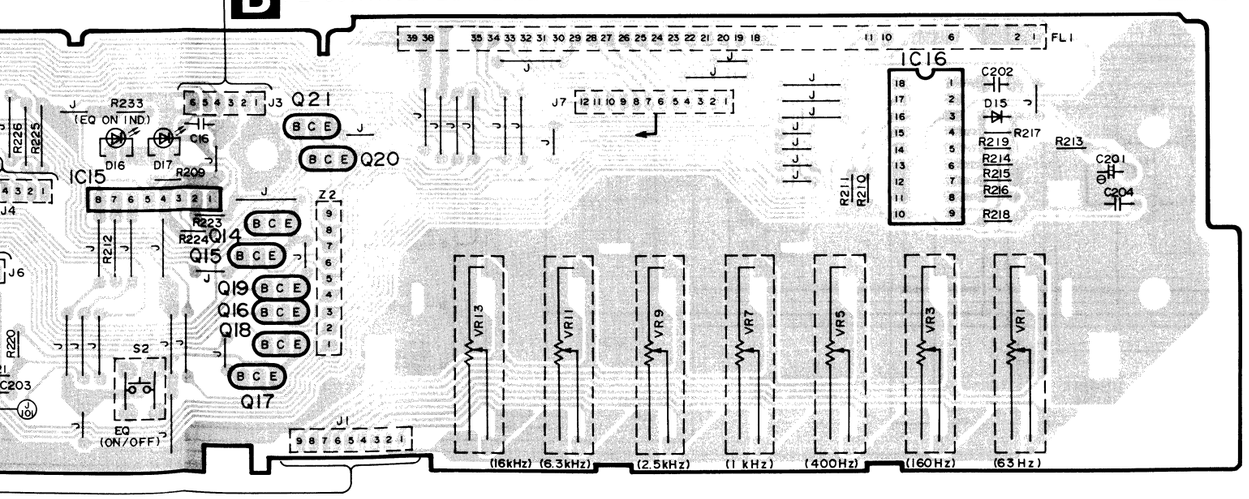


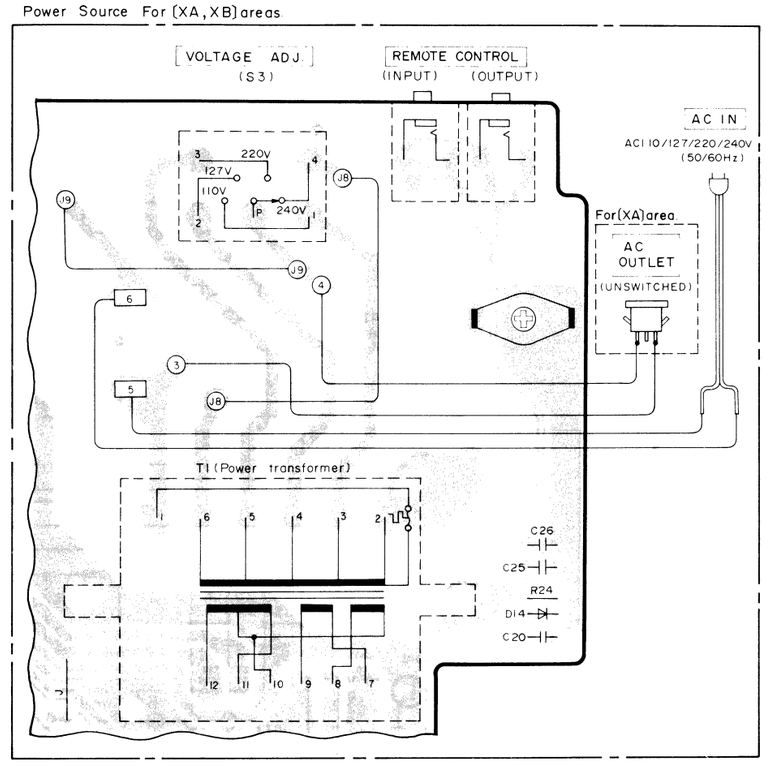
6 7 8 9 10 11 12 13 14 15 16 17 18 19

AM

SPECTRAM ANALIZER B.P.FILTER AMP/

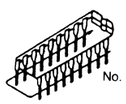




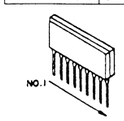


•TERMINAL GUIDE OF TRANSISTORS, DIODES AND IC's

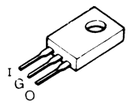
LC4066BH LA6324N	14pin
NJU4051BD	16pin
LC6528C3189	18pin
AN7337	20pin
HD614042SH12	64pin



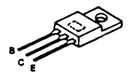
M5223L	8 Pin
NJM4559S	9 Pin



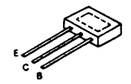
AN78N05



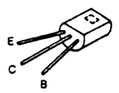
2SD1762, 2SB1185



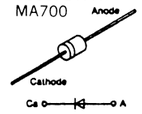
UN4211,
2SD1915, UN4111
2SC3311



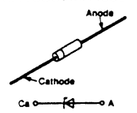
2SA1015



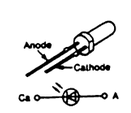
RL1N4003N02
1SS178TPA7
MA700



MA4120, MA4068
MA4030, MA4051



LN31GCPH



A INPUT, OUTPUT TERMINAL/
B.P. FILTER AMP/
SPECTRAM ANALIZER
B.P. FILTER AMP/
POWER SUPPLY
CIRCUIT

IC5~8
LA6324N
SPECTRAM
ANALYZER B.P.F

Q12
2SC3311
REMOTE OFF

Q13
UN4111
REMOTE CONTROL

INPUT
REMOTE
CONTROL
OUTPUT

SOURCE SIGNAL

SPECTRAM
SIGNAL

For
(EG) area

L ch
LINE IN
R ch

L ch
LINE OUT
R ch

Q5,6
2SD1915
MUTING

Q8
UN4111
SWITCHING

Q9
UN4211
SWITCHING

Q7
UN4211
SWITCHING

IC1
LC4066BH
SWITCHING

Q4
UN4111
MUTING
CONT.

Q3
UN4211
MUTING
CONT.

IC11,12
NJU4051BD
MULTIPLEXER

IC2
NJM4559S
BUFFER AMP

For (EG)
area

B FL CONTROL/EQUALIZER
LEVEL CONTROL
REMOTE CONTROL CIRCUIT

Q14~21
UN4111
FL DRIVE

IC3,4
AN7337
GRAPHIC EQUALIZER

13 14 15 16 17 18 19 20 21 22 23 24 25 26

IC 14
HD614042SH12
MICRO COMPUTER

IC 15
M5223L
BUFFER/LED DRIVE

IC 16
LC6528C-3189
MICRO COMPUTER
(for REMOTE CONTROL)

IC3,4
AN7337
GRAPHIC EQUALIZER

/EQUALIZER
ROL
ITROL CIRCUIT

Q14~21
UN4111
FL DRIVE

Q11
2SA1015
RESET

Q10
2SC3311
RESET

Q1
2SD1762
REGULATOR

IC13
AN78N05
REGULATOR

Q2
2SB1185
REGULATOR

SOURCE SIGNAL

SPECTRAM SIGNAL

For (EG) area

C POWER SWITCH CIRCUIT

Not used (XL) area.

For (EG, EW) areas.

Power Source For (XA, XB) areas.

For (XA) area.

■ SCHEMATIC DIAGRAM

(This schematic diagram may be modified at any time with the development of new technology.)

Notes:
- **S1:** Power switch in "**on**" position.
- **S2:** Equalization mode select switch.
- **S3:** Voltage selector switch in "**240 V**" position. (For [XA] and [XB] areas.)
- Indicated voltage values are the standard values for the unit measured by the DC electronic circuit tester (high-impedance) with the chassis taken as standard. Therefore, there may exist some errors in the voltage values, depending on the internal impedance of the DC circuit tester.

Source signal (Lch) ⇨ Spectrum analyzer signal

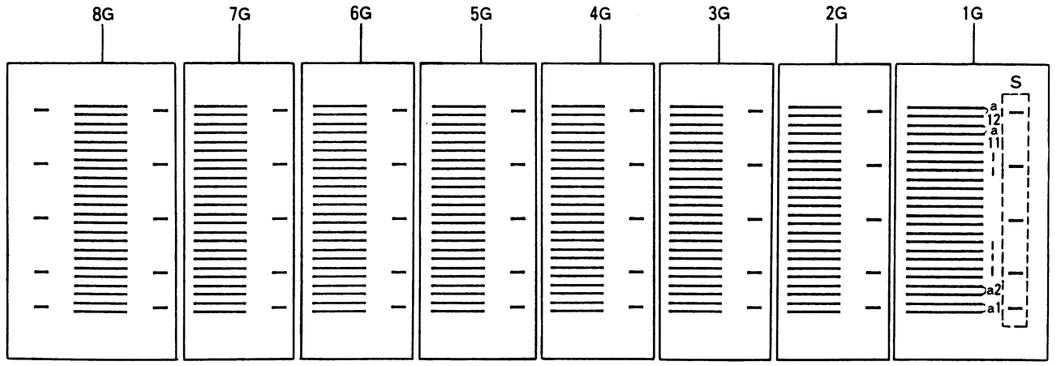
Positive voltage lines — Negative voltage lines

- Important safety notice:
  Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.

***Caution!**
IC and LSI are sensitive to static electricity.
Secondary trouble can be prevented by taking care during repair.
*Cover the parts boxes made of plastics with aluminum foil.
*Ground the soldering iron.
*Put a conductive mat on the work table.
*Do not touch the legs of IC or LSI with the fingers directly.

■ DESCRIPTION OF FL PANEL

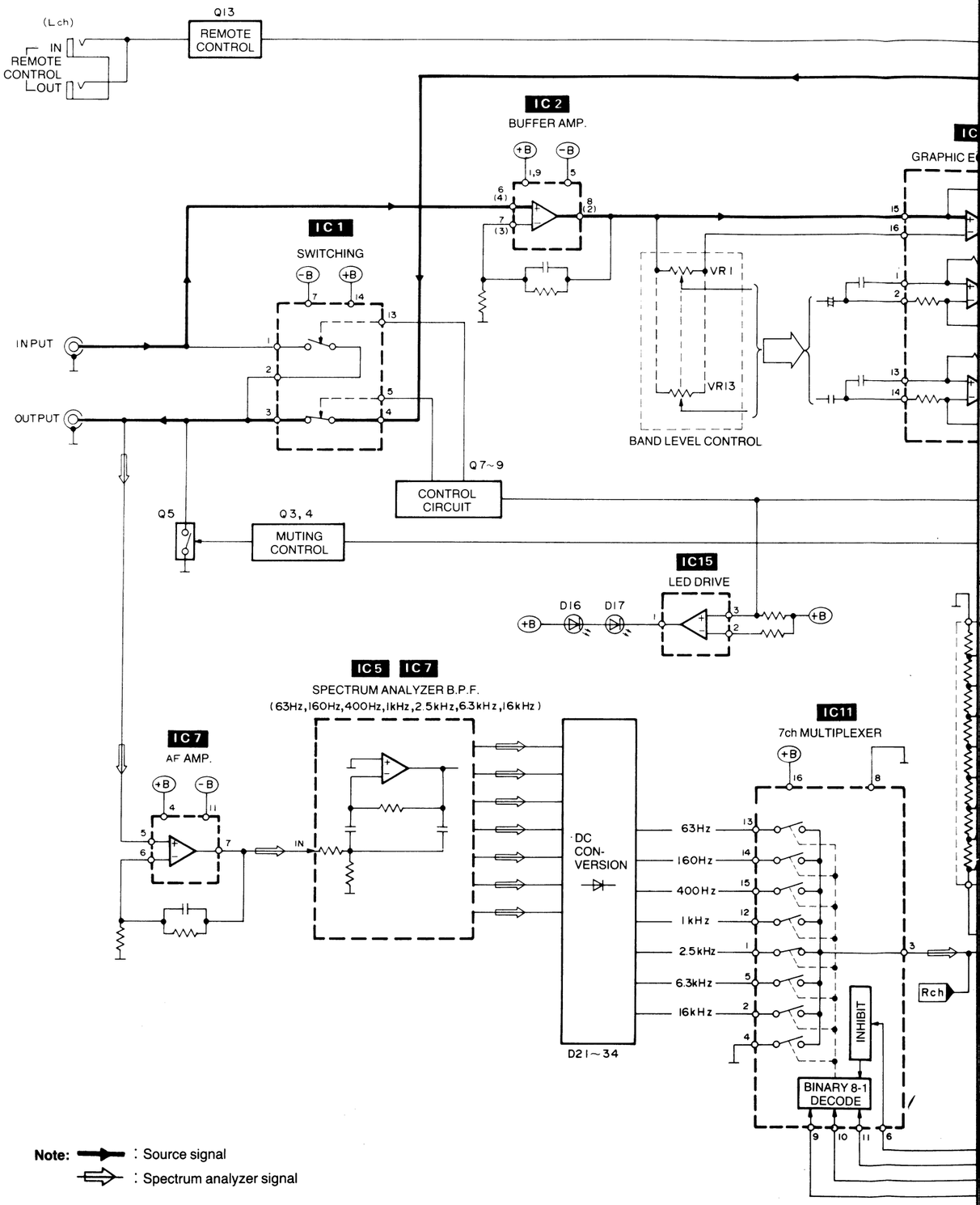
●GRID ASSIGNMENT



●PIN CONNECTION

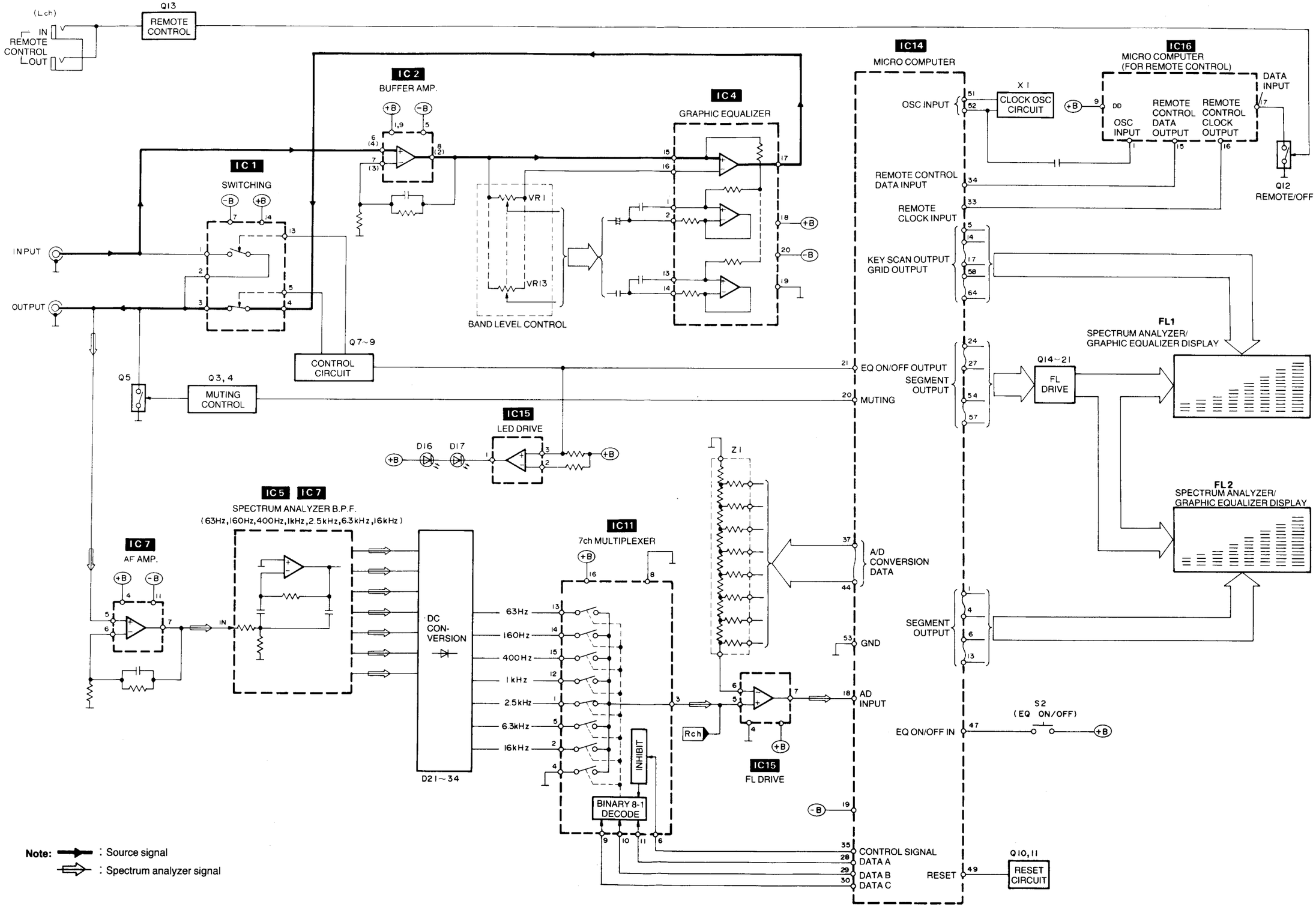
Segment terminal No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Name of terminal	F2	F2	NP	NP	a1	1G	a2	a3	a4	a5	2G	a6	a7	a8	3G	a9	a10	a11	4G	a12
Segment terminal No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	
Name of terminal	S	5G	NP	NP	NP	NP	NP	NP	6G	7G	NP	NP	NP	8G	NP	NP	NP	F1	F1	

■ BLOCK DIAGRAM



Note: → : Source signal
⇨ : Spectrum analyzer signal

■ BLOCK DIAGRAM

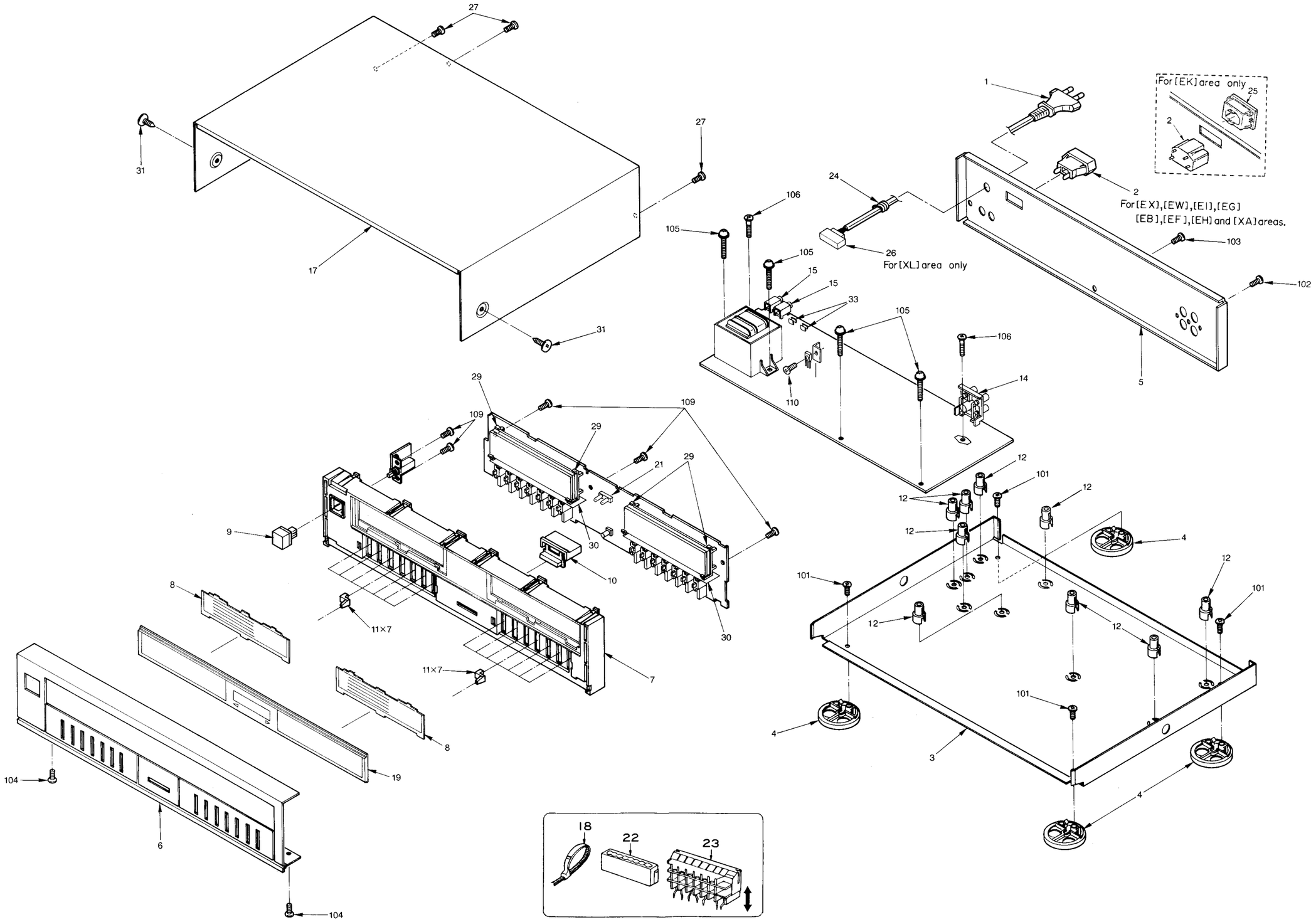


19	20
4G	a12
39	
F1	

SH-E60

SH-E60

■ EXPLODED VIEW



■ REP

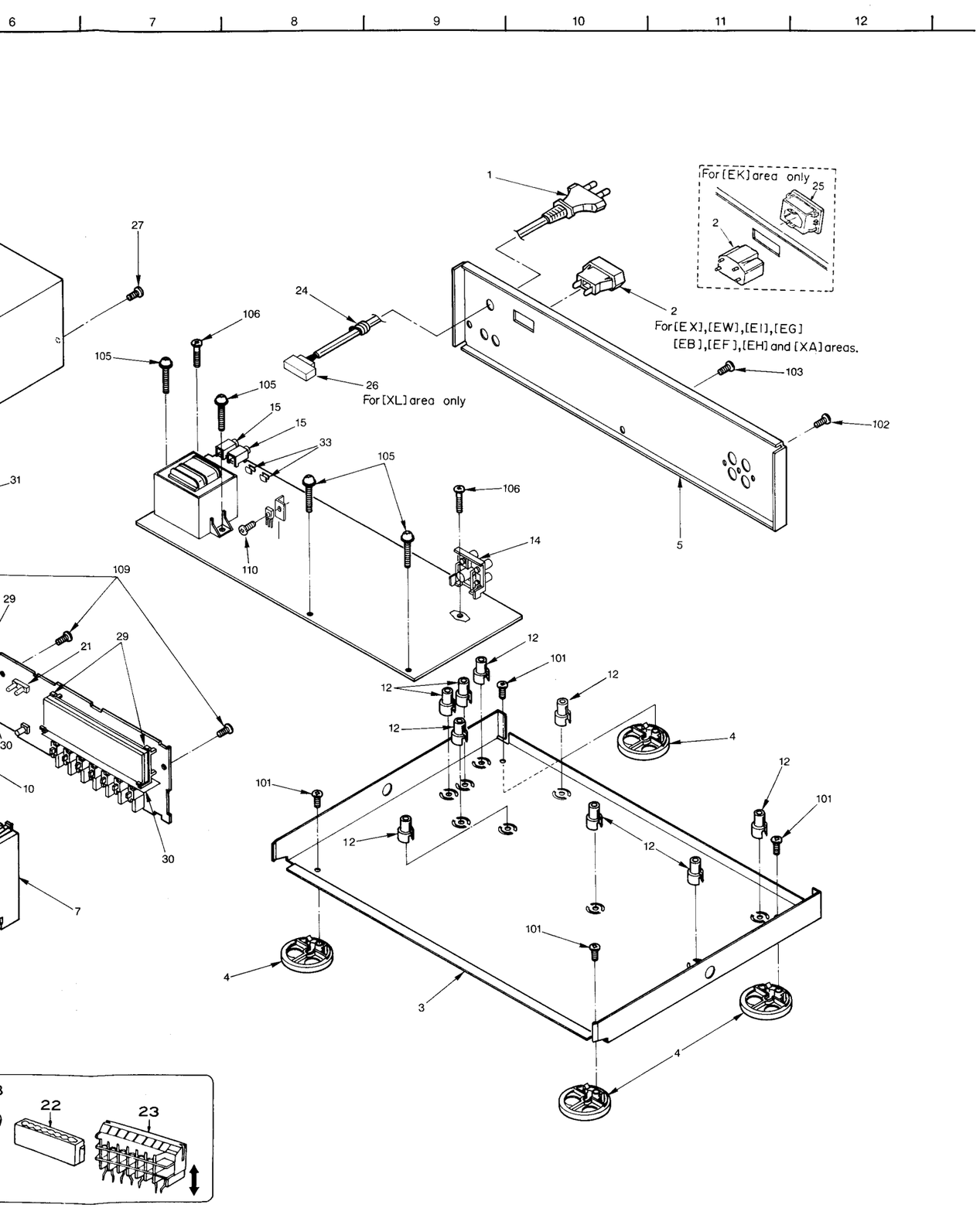
Notes : * Imp
Cor
ma
* Bra
Par

•CABIN

Ref. No.
CABINET AND
1 ⚠ (EX, EH, EB) (EF, EI, EW) (EG)
1 ⚠ (XL)
1 ⚠ (XB)
1 ⚠ (XA)
1 ⚠ (EK)
2 ⚠ (XA)
2 ⚠ (EX, EH, EB) (EF, EI, EW) (EG)
2 ⚠ (EK)
3
4
5 (EX)
5 (EW)
5 (EH, EB, EF) (EI, EG)
5 (EK)
5 (XL)
5 (XA)
5 (XB)
6
7

•PACKI

Ref. No.
PACKING MAT
P1 (EX, EH, EB) (EI, EW, EG) (XL, XB, XA)
P1 (EF)
P1 (EK)
P2
P3
P4
P5



■ REPLACEMENT PARTS LIST

Notes : * Important safety notice :
Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.
* Bracketed indications in Ref. No. columns specify the area. (Refer to the first page for area.)
Parts without these indications can be used for all areas.

•CABINET PARTS LIST

Ref. No.	Part No.	Description
CABINET AND CHASSIS		
1 ⚠ (EX, EH, EB) (EF, EI, EW) (EG)	SFDAB31E01-M	POWER CORD
1 ⚠ (XL)	SJAG23	POWER CORD
1 ⚠ (XB)	SJA182	POWER CORD
1 ⚠ (XA)	SJA186	POWER CORD
1 ⚠ (EK)	SJA189	POWER CORD
2 ⚠ (XA)	SJS9221-1	SOCKET
2 ⚠ (EX, EH, EB) (EF, EI, EW) (EG)	SJS9225	AC OUTLET
2 ⚠ (EK)	SJS9332B	AC OUTLET
3	SKUK240	BOTTOM BOARD
4	SKL307	FOOT
5 (EX)	SGPK480-1A	REAR PANEL
5 (EW)	SGPK480-1B	REAR PANEL
5 (EH, EB, EF) (EI, EG)	SGPK480-1C	REAR PANEL
5 (EK)	SGPK480-2A	REAR PANEL
5 (XL)	SGPK480-3A	REAR PANEL
5 (XA)	SGPK480-4C	REAR PANEL
5 (XB)	SGPK480-5A	REAR PANEL
6	SGWKHE60-KE	FRONT PANEL
7	SGXHD5000-KN	FRONT GRILL ASS'Y
8	SDUK17B	FILTER
9	SBC666-1	BUTTON, POWER
10	SBCK73	BUTTON, EQ
11	SBDK23	KNOB, LEVEL
12	SHE187-K	SPACER
14	SJF3057-8NA	TERMINAL BOARD
15	SJJK47	JACK, SOCKET
17	SKCK241K16	CABINET
18 (EW, EG)	SHR301	CLAMPER
19	SGUK29A	FILTER
21	SJS50571DS	CONNECTOR(5P)
22	SJSK90403DS	CONNECTOR(4P)
22	SJSK90503DS	CONNECTOR(5P)
22	SJSK90603DS	CONNECTOR(6P)
22	SJSK90703DS	CONNECTOR(7P)
22	SJSK90903DS	CONNECTOR(9P)
23	SJSD0405	CONNECTOR(4P)
23	SJSD0505	CONNECTOR(5P)
23	SJSD0605	CONNECTOR(6P)
23	SJSD0705	CONNECTOR(7P)
23	SJSD0905	CONNECTOR(9P)
24	SHR127	SPACER, POWER CORD
25 (EK)	SJS9332A	AC OUTLET COVER
26 (XL)	SFEZQ34G01	CLAMPER
27	XTB3+8JFZ	SCREW
29	SHRK943	FL HOLDER
30	SMCK36	SHIELD PLATE
31 (EW, EG)	SNE2095-5	SCREW
33	SJT347	FUSE HOLDER
101	XTB3+8G	SCREW
102	XTB3+8GFZ	SCREW
103	XTB3+8JFZ	SCREW
104	XTBS3+8JFZ1	SCREW
105	XTW3+20T	SCREW
106	XTBS3+20F1	SCREW
109	XTV3+10G	SCREW
110	XTV3+8J	SCREW

•PACKING PARTS LIST

Ref. No.	Part No.	Description
PACKING MATERIAL		
P1 (EX, EH, EB) (EI, EW, EG) (XL, XB, XA)	SPGK337	PACKING CASE
P1 (EF)	SPGK338	PACKING CASE
P1 (EK)	SPGK339	PACKING CASE
P2	SPSK133-1	PAD
P3	SPSK134-1	PAD
P4	SPPK56	PROTECTION COVER
P5	SFYF10A30	POLYETHYLENE BAG
ACCESSORIES		
A1 (EF, XA)	SQFK10181	INSTRUCTION BOOK
A1 (EX, EH, EB) (EW)	SQFK10182	INSTRUCTION BOOK
A1 (EG)	SQFK10183	INSTRUCTION BOOK
A1 (EI)	SQFK10184	INSTRUCTION BOOK
A1 (EK, XL, XB)	SQFK10185	INSTRUCTION BOOK
A2	SJPK2202-1	CORD
A3	SJP2257T	CORD
A5 ⚠ (XB, XA)	RJP120ZBS-H	AC PLUG ADAPTOR

●ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
INTEGRATED CIRCUITS		
IC1	LC4066BH	I.C. SWITCHING
IC2	NJM4559S	I.C. BUFFER
IC3	AN7337	I.C. GRAPHIC EQ.
IC4	AN7337	I.C. GRAPHIC EQ.
IC5	LA6324N	I.C. B.P.F.
IC6	LA6324N	I.C. B.P.F.
IC7	LA6324N	I.C. B.P.F.
IC8	LA6324N	I.C. B.P.F.
IC11	NJU4051BD	I.C. MPX
IC12	NJU4051BD	I.C. MPX
IC13	AN78N05	I.C. REGURATOR
IC14	HD614042SH12	I.C. MICRO COM.
IC15	M5223L	I.C. BUFFER
IC16	LC6528C-3189	I.C. MICRO COM.
TRANSISTORS		
Q1	2SD1762DEF	TRANSISTOR
Q2	2SB1185DEF	TRANSISTOR
Q3	UN4211	TRANSISTOR
Q4	UN4111	TRANSISTOR
Q5	2SD1915S	TRANSISTOR
Q6	2SD1915S	TRANSISTOR
Q7	UN4211	TRANSISTOR
Q8	UN4111	TRANSISTOR
Q9	UN4211	TRANSISTOR
Q10	2SC3311A-Q	TRANSISTOR
Q11	2SA1015Y	TRANSISTOR
Q12	2SC3311A-Q	TRANSISTOR
Q13	UN4111	TRANSISTOR
Q14	UN4111	TRANSISTOR
Q15	UN4111	TRANSISTOR
Q16	UN4111	TRANSISTOR
Q17	UN4111	TRANSISTOR
Q18	UN4111	TRANSISTOR
Q19	UN4111	TRANSISTOR
Q20	UN4111	TRANSISTOR
Q21	UN4111	TRANSISTOR
DIODES		
D1	RL1N4003N02	DIODE
D2	RL1N4003N02	DIODE
D3	RL1N4003N02	DIODE
D4	RL1N4003N02	DIODE
D5	MA4120-H	DIODE
D6	MA4120-H	DIODE
D7	MA4051-M	DIODE
D8	RL1N4003N02	DIODE
D9	RL1N4003N02	DIODE
D10	MA4068H	DIODE
D12	MA4030M	DIODE
D13	1SS178TPA7	DIODE
D14	1SS178TPA7	DIODE
D15	1SS178TPA7	DIODE
D16	LN31GCPH	DIODE
D17	LN31GCPH	DIODE
D18	1SS178TPA7	DIODE
D19	1SS178TPA7	DIODE
D21	MA700A	DIODE
D22	MA700A	DIODE
D23	MA700A	DIODE
D24	MA700A	DIODE
D25	MA700A	DIODE
D26	MA700A	DIODE
D27	MA700A	DIODE
D28	MA700A	DIODE
D29	MA700A	DIODE
D30	MA700A	DIODE
D31	MA700A	DIODE
D32	MA700A	DIODE
D33	MA700A	DIODE
D34	MA700A	DIODE
D38	1SS178TPA7	DIODE
VARIABLE RESISTORS		
VR1	SVSK151KW15	V.R
VR2	SVSK151KW15	V.R
VR3	SVSK151KW15	V.R
VR4	SVSK151KW15	V.R
VR5	SVSK151KW15	V.R
VR6	SVSK151KW15	V.R
VR7	SVSK151KW15	V.R
VR8	SVSK151KW15	V.R
VR9	SVSK151KW15	V.R
VR10	SVSK151KW15	V.R
VR11	SVSK151KW15	V.R
VR12	SVSK151KW15	V.R
VR13	SVSK151KW15	V.R
VR14	SVSK151KW15	V.R
COILS AND TRANSFORMERS		
T1 ⚠ (EX, EH, EB) (EF, EI, EW) (EG)	SLTK5K17	POWER TRANSFORMER
T1 ⚠ (EK, XL)	SLTK5K18	POWER TRANSFORMER
T1 ⚠ (XB, XA)	SLTK5K19	POWER TRANSFORMER
COMPONENT COMBINATIONS		
Z1	EXBF10L134J	CNMBINATION COM
Z2	EXBF9E104J	COMBINATION
DISPLAYS		
FL1	SADFV219	DISPLAY
FL2	SADFV219	DISPLAY
FUSES		
F1 ⚠ (EW, EG)	XBA2C12TR0	FUSE
SWITCHES		
S1 ⚠	SSHK81	SW, POWER
S2	EVQQB011W	SW, EQ.
S3 ⚠ (XB, XA)	SSR187-1	SW, VOLTAGE SELECTOR
OTHERS		
X1	EF0FC4004A3	OSCILLATOR

■ RESISTORS AND CAPACITORS

Notes : * Important safety notice :
Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.
* Bracketed indications in Ref. No. columns specify the area. (Refer to the first page for area.)
Parts without these indications can be used for all areas.

Numbering System of Resistor

Example:

ERD	25	F	J	102
Type	Wattage (1/4W)	Shape	Tolerance	Value (1KΩ)
ERX	2	AN	J	471
Type	Wattage (2W)	Shape	Tolerance	Value (470Ω)

Numbering System of Capacitor

Example:

ECKD	1H	102	Z	F
Type	Voltage (50V)	Value (0.001μF)	Tolerance	Peculiarity
ECEA	50	M	330	
Type	Voltage (50V)	Pecliarity	Value (33μF)	

● Capacity are in microfarads (μF) unless specified otherwise, P = Pico-farads (pF) F = Farads (F).
● Resistance are in ohms (Ω), unless specified otherwise, 1K = 1,000Ω, 1M = 1,000kΩ

Resistor Type		Wattage		Tolerance
ERD	: Carbon	10 : 1/8W	12 : 1/2W	J : ±5%
ERG	: Metal Oxide	14 : 1/4W	25 : 1/4W	F : ±1%
ERQ	: Fuse Type Metal	1A : 1W	18 : 1/8W	G : ±2%
ERX	: Metal Film	S2 : 1/4W	S1 : 1/2W	J : ±5%
ERD L	: Carbon (chip)	2F : 1/4W	50 : 1/2W	K : ±10%
ERO K	: Metal Film (chip)	2A : 2W	3A : 3W	M : ±20%
ERC	: Solid	6G : 1/10W	8G : 1/8W	
ERF	: Incombustible Box-Shaped			
ERM	: Wire-Wound			
RRJ	: Cip Resistor			
ERJ	: Cip Resistor			

Capacitor Type		Voltage		Tolerance
ECE	: Electrolytic	0J : 6.3V	1A : 10V	K : ±10%
ECCD	: Ceramic	1C : 16V	1E : 25V	M : ±20%
ECKD	: Ceramic Capacitor	1H : 50V	1V : 35V	Z : +80 % −20
ECQM	: Poyester	50 : 50V	05 : 50V	J : ±5%
ECQP	: Polypropylene	2H : 500V	2A : 100V	G : ±2%
ECG	: Ceramic	1 : 100V	1J : 63V	F : ±1%
ECEA N	: Non Polar Electrolytic	KC : 400V AC		C : ±0.25pF
QCU	: Ceramic (Chip Type)	KC : 125V AC		D : ±0.5pF
ECUX	: Ceramic (Chip Type)	(UL)		
ECF	: Semiconductor			
EECW	: Liquid electrolyte double layer capacitor			

Ref. No.	Part No.	Value.
RESISTORS(VALUE,WATTAGE)		
R1	ERDS1FJ122	1.2K 1/2
R2	ERDS1FJ122	1.2K 1/2
R3	ERDS2TJ102	1K 1/4
R4	ERDS2TJ102	1K 1/4
R5	ERDS2TJ472	4.7K 1/4
R6	ERDS2TJ103	10K 1/4
R7	ERD25FJ271	270 1/4
R8	ERD25FJ271	270 1/4
R9	ERDS2TJ102	1K 1/4
R11	ERDS2TJ222	2.2K 1/4
R12	ERDS2TJ222	2.2K 1/4
R13	ERDS2TJ822	8.2K 1/4
R14	ERDS2TJ182	1.8K 1/4
R15	ERDS2TJ332	3.3K 1/4
R16	ERDS2TJ332	3.3K 1/4
R17	ERDS2TJ102	1K 1/4
R18	ERDS2TJ104	100K 1/4
R19	ERDS2TJ103	10K 1/4
R20	ERDS2TJ104	100K 1/4
R21	ERDS2TJ104	100K 1/4
R22	ERDS2TJ561	560 1/4
R23	ERDS2TJ561	560 1/4
R24	ERDS2TJ103	10K 1/4
R25	ERDS2TJ473	47K 1/4
R26	ERDS2TJ223	22K 1/4
R27	ERDS2TJ102	1K 1/4
R28	ERDS2TJ471	470 1/4
R30	ERD2FCJ4R7	4.7 1/4
R31	ERD2FCJ4R7	4.7 1/4
R33	ERDS2TJ104	100K 1/4
R35	ERDS2TJ562	5.6K 1/4
R36	ERD2FCJ4R7	4.7 1/4
R41	ERDS2TJ104	100K 1/4
R42	ERDS2TJ104	100K 1/4
R43	ERDS2TJ102	1K 1/4
R44	ERDS2TJ102	1K 1/4
R45	ERDS2TJ104	100K 1/4
R46	ERDS2TJ104	100K 1/4
R47	ERDS2TJ472	4.7K 1/4
R48	ERDS2TJ472	4.7K 1/4
R49	ERDS2TJ473	47K 1/4
R50	ERDS2TJ473	47K 1/4
R51	ERDS2TJ272	2.7K 1/4
R52	ERDS2TJ272	2.7K 1/4
R53	ERDS2TJ272	2.7K 1/4
R54	ERDS2TJ272	2.7K 1/4
R55	ERDS2TJ104	100K 1/4
R56	ERDS2TJ104	100K 1/4
R57	ERDS2TJ561	560 1/4
R58	ERDS2TJ561	560 1/4
R59	ERDS2TJ104	100K 1/4
R60	ERDS2TJ104	100K 1/4
R61	ERDS2TJ104	100K 1/4
R62	ERDS2TJ104	100K 1/4
R63	ERDS2TJ104	100K 1/4
R64	ERDS2TJ104	100K 1/4
R65	ERDS2TJ184	180K 1/4
R66	ERDS2TJ184	180K 1/4
R67	ERDS2TJ823	82K 1/4
R68	ERDS2TJ823	82K 1/4
R69	ERDS2TJ822	8.2K 1/4
R70	ERDS2TJ333	33K 1/4
R71	ERDS2TJ154	150K 1/4
R72	ERDS2TJ154	150K 1/4
R73	ERDS2TJ272	2.7K 1/4
R74	ERDS2TJ272	2.7K 1/4
R75	ERDS2TJ333	33K 1/4
R76	ERDS2TJ822	8.2K 1/4
R77	ERDS2TJ563	56K 1/4
R78	ERDS2TJ563	56K 1/4
R79	ERDS2TJ183	18K 1/4
R80	ERDS2TJ183	18K 1/4
R81	ERDS2TJ334	330K 1/4
R82	ERDS2TJ334	330K 1/4
R83	ERDS2TJ272	2.7K 1/4
R84	ERDS2TJ272	2.7K 1/4
R85	ERDS2TJ683	68K 1/4
R86	ERDS2TJ683	68K 1/4
R87	ERDS2TJ563	56K 1/4
R88	ERDS2TJ563	56K 1/4
R89	ERDS2TJ822	8.2K 1/4
R90	ERDS2TJ822	8.2K 1/4
R91	ERDS2TJ154	150K 1/4
R92	ERDS2TJ154	150K 1/4
R93	ERDS2TJ272	2.7K 1/4
R94	ERDS2TJ272	2.7K 1/4
R95	ERDS2TJ333	33K 1/4
R96	ERDS2TJ333	33K 1/4
R97	ERDS2TJ563	56K 1/4
R98	ERDS2TJ563	56K 1/4
R99	ERDS2TJ822	8.2K 1/4
R100	ERDS2TJ822	8.2K 1/4
R101	ERDS2TJ154	150K 1/4
R102	ERDS2TJ154	150K 1/4
R103	ERDS2TJ272	2.7K 1/4
R104	ERDS2TJ272	2.7K 1/4
R105	ERDS2TJ333	33K 1/4
R106	ERDS2TJ333	33K 1/4
R107	ERDS2TJ563	56K 1/4
R108	ERDS2TJ563	56K 1/4
R109	ERDS2TJ822	8.2K 1/4
R110	ERDS2TJ822	8.2K 1/4
R111	ERDS2TJ154	150K 1/4
R112	ERDS2TJ154	150K 1/4
R113	ERDS2TJ152	1.5K 1/4
R114	ERDS2TJ152	1.5K 1/4
R115	ERDS2TJ273	27K 1/4
R116	ERDS2TJ273	27K 1/4
R117	ERDS2TJ563	56K 1/4
R118	ERDS2TJ563	56K 1/4
R119	ERDS2TJ822	8.2K 1/4
R120	ERDS2TJ822	8.2K 1/4
R121	ERDS2TJ124	120K 1/4
R122	ERDS2TJ124	120K 1/4
R123	ERDS2TJ820	82 1/4
R124	ERDS2TJ820	82 1/4
R125	ERDS2TJ333	33K 1/4
R126	ERDS2TJ333	33K 1/4
R127	ERDS2TJ563	56K 1/4
R128	ERDS2TJ563	56K 1/4
R129	ERDS2TJ682	6.8K 1/4
R130	ERDS2TJ682	6.8K 1/4
R131	ERDS2TJ124	120K 1/4
R132	ERDS2TJ124	120K 1/4

Ref. No.	Part No.	Value.
R133	ERDS2TJ681	680 1/4
R134	ERDS2TJ681	680 1/4
R135	ERDS2TJ682	6.8K 1/4
R136	ERDS2TJ682	6.8K 1/4
R137	ERDS2TJ683	68K 1/4
R138	ERDS2TJ683	68K 1/4
R209	ERDS2TJ101	100 1/4
R210	ERDS2TJ103	10K 1/4
R211	ERDS2TJ103	10K 1/4
R212	ERD25FJ102	1K 1/4
R213	ERDS2TJ223	22K 1/4
R214	ERDS2TJ104	100K 1/4
R215	ERDS2TJ104	100K 1/4
R216	ERDS2TJ104	100K 1/4
R217	ERDS2TJ222	2.2K 1/4
R218	ERDS2TJ104	100K 1/4
R219	ERDS2TJ104	100K 1/4
R220	ERDS2TJ102	1K 1/4
R221	ERDS2TJ104	100K 1/4
R222	ERDS2TJ684	680K 1/4
R223	ERDS2TJ104	100K 1/4
R224	ERDS2TJ104	100K 1/4
R225	ERD25FJ103	10K 1/4
R226	ERD25FJ103	10K 1/4
R233	ERDS2TJ100	10 1/4
CAPACITORS(VALUE,VOLTAGE)		
C1	ECKD1H333PF	0.033 50
C2	ECKD1H333PF	0.033 50
C3	ECEA1VU221	220 35
C4	ECEA1VU221	220 35
C5	ECEA1CKS100	10 16
C6	ECEA1CKS100	10 16
C7	ECKD1H223PF	0.022 50
C8	ECKD1H223PF	0.022 50
C9	ECEA1HK4R7	4.7 50
C10	ECKD1H223PF	0.022 50
C11	ECEA1HU221	220 50
C12	ECKD1H223PF	0.022 50
C13	ECEA1CKS100	10 16
C14	ECKD1H223PF	0.022 50
C15	ECEA1HU221	220 50
C16	ECBT1E223ZF	0.022 25
C17	ECEA1HK4R7	4.7 50
C18	ECKD1H223PF	0.022 50
C19	ECKD1H223PF	0.022 50
C20	ECKD1H472KB	0.0047 50
C21	ECKD1H472KB	0.0047 50
C22	ECKD1H103PF	0.01 50
(EG)		
C22	ECKD1H223PF	0.022 50
(EX, EH, EB)		
(EF, EI, EW)		

Ref. No.	Part No.	Value.
(EK, XL, XB)		
(XA)		
C23	ECKD1H103PF	0.01 50
(EG)		
C24	ECEA0JS102	1000 6.3
C25	ECKD1H223PF	0.022 50
C26	ECKD1H223PF	0.022 50
C27	ECEA1HKR68	0.68 50
C28	ECBT1E223ZF	0.022 25
C29	ECEA1CKS100	10 16
C41	ECKD1H221KB	220P 50
(EG)		
C42	ECKD1H221KB	220P 50
(EG)		
C43	ECEA1HK010	1 50
C44	ECEA1HK010	1 50
C45	ECKD1H101KB	100P 50
C46	ECKD1H101KB	100P 50
C47	ECKD1H471KB	470P 50
C48	ECKD1H471KB	470P 50
C49	ECFTD563KXL	0.056 25
C50	ECFTD563KXL	0.056 25
C51	ECEA1HK3R3	3.3 50
C52	ECEA1HK3R3	3.3 50
C53	ECFTD273KXL	0.027 25
C54	ECFTD273KXL	0.027 25
C55	ECEA1HK010	1 50
C56	ECEA1HK010	1 50
C57 ⚠	ECFTD103KXL	0.01 25
C58 ⚠	ECFTD103KXL	0.01 25
C59	ECEA1HKR47	0.47 50
C60	ECEA1HKR47	0.47 50
C61	ECKD1H562KB	0.0056 50
C62	ECKD1H562KB	0.0056 50
C63	ECEA1HKR15	0.15 50
C64	ECEA1HKR15	0.15 50
C65	ECKD1H182KB	0.0018 50
C66	ECKD1H182KB	0.0018 50
C67	ECFTD823KXL	0.082 25
C68	ECFTD823KXL	0.082 25
C69	ECKD1H561KB	560P 50
C70	ECKD1H561KB	560P 50
C71	ECFTD333KXL	0.033 25
C72	ECFTD333KXL	0.033 25
C73	ECKD1H391KB	390P 50
C74	ECKD1H391KB	390P 50
C75 ⚠	ECFTD103KXL	0.01 25
C76 ⚠	ECFTD103KXL	0.01 25
C77	ECEA1CKS100	10 16
C78	ECEA1CKS100	10 16
C79	ECEA1HK010	1 50
C80	ECEA1HK010	1 50
C81	ECCD1H100KC	10P 50

Ref. No.	Part No.	Value.
C82	ECCD1H100KC	10P 50
C83	ECFTD333KXL	0.033 25
C84	ECFTD333KXL	0.033 25
C85	ECFTD333KXL	0.033 25
C86	ECFTD333KXL	0.033 25
C87	ECEA1HK010	1 50
C88	ECEA1HK010	1 50
C89	ECFTD393KXL	0.039 25
C90	ECFTD393KXL	0.039 25
C91	ECFTD393KXL	0.039 25
C92	ECFTD393KXL	0.039 25
C93	ECEA1HK010	1 50
C94	ECEA1HK010	1 50
C95	ECKD1H472KB	0.0047 50
C96	ECKD1H472KB	0.0047 50
C97	ECKD1H472KB	0.0047 50
C98	ECKD1H472KB	0.0047 50
C99	ECEA1HK010	1 50
C100	ECEA1HK010	1 50
C101	ECFTD123KXL	0.012 25
C102	ECFTD123KXL	0.012 25
C103	ECFTD123KXL	0.012 25
C104	ECFTD123KXL	0.012 25
C105	ECEA1HK010	1 50
C106	ECEA1HK010	1 50
C107	ECKD1H222KB	0.0022 50
C108	ECKD1H222KB	0.0022 50
C109	ECKD1H222KB	0.0022 50
C110	ECKD1H222KB	0.0022 50
C111	ECEA1HK010	1 50
C112	ECEA1HK010	1 50
C113	ECKD1H821KB	820P 50
C114	ECKD1H821KB	820P 50
C115	ECKD1H821KB	820P 50
C116	ECKD1H821KB	820P 50
C117	ECEA1HK010	1 50
C118	ECEA1HK010	1 50
C119	ECKD1H391KB	390P 50
C120	ECKD1H391KB	390P 50
C121	ECKD1H391KB	390P 50
C122	ECKD1H391KB	390P 50
C123	ECEA1HK010	1 50
C124	ECEA1HK010	1 50
C125	ECKD1H101KB	100P 50
C126	ECKD1H101KB	100P 50
C139	ECKD1H181KB	180P 50
(EG)		
C140	ECKD1H181KB	180P 50
(EG)		
C201	ECEA1HK4R7	4.7 50
C202	ECFTD102KXL	0.001 25
C203	ECKD1H223PF	0.022 50
C204	ECBT1E223ZF	0.022 25
C220	ECBT1E223ZF	0.022 25
R36	ERD2FCG470	47 1/4

Printed in Japan
F880303900 YY/TW/IM